

**A TECHNIQUE FOR PRESERVATION OF CHOKE VESSELS FOR EXPANDING THE LIMITS OF PECTORALIS MAJOR MYOCUTANEOUS FLAP FOR RECONSTRUCTION IN ADVANCED ORAL CANCER SURGERY (T4A WITH SKIN INVOLVEMENT)**Parijat Suryavanshi<sup>\*1</sup>, Gitika Nanda Singh<sup>2</sup> and Vinod Jain<sup>3</sup><sup>1</sup>Associate Professor, Department of Surgery, King George's Medical University, Lucknow.<sup>2</sup>Assistant Professor, Department of Surgery, King George's Medical University, Lucknow.<sup>3</sup>Professor, Department of Surgery, King George's Medical University, Lucknow.**\*Corresponding Author: Prof. Parijat Suryavanshi**

Associate Professor, Department of Surgery, King George's Medical University, Lucknow.

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**INTRODUCTION**

Pectoralis major myocutaneous flap was first described in 1970s by Ariyan.<sup>[1]</sup> It is one of the most sturdy and versatile flap for reconstruction of large defects following resection of large oral cancers. In developing countries like India, it is not uncommon to have oral cancer patients with large primary involving skin of face and resectable. Such cases present a challenge to the treating Surgical Oncologist and reconstructive surgeon as option of free flap reconstruction may not be always available. In several centers treating oral cancers, there may be a paucity of plastic and reconstructive surgeons. In high volume centers like King George's Medical University where several oral cancer cases are operated every week, limited number of reconstructive surgeons doing free flap has made pectoralis major myocutaneous (PMMC) flap a workhorse for reconstruction of defect following oral cancer reconstruction.<sup>[2]</sup> There, however, is a limitation to the amount of skin supplied by PMMC flap in case of large defects necessitating reconstruction of both buccal mucosa and skin with a bipedal flap with a concern of flap necrosis when surgeon overshoots the territory of PMMC flap while raising large flaps. We hereby describe a technique to increase the size of PMMC flap using concept of choke vessels.

**MATERIALS AND METHODS**

20 cases of T4a (as per AJCC 8<sup>th</sup> edition)[3] Oral cancer with involvement of buccal mucosa and more than 4 cm of skin involvement, who fulfilled the inclusion criteria were included for this study and planned for resection and reconstruction by PMMC flap using modified technique (as described below). Inclusion criteria were age less than 60 years, No H/o diabetes, hypertension, collagen vascular disease, ipsilateral anterior chest trauma or previous scar on ipsilateral anterior chest wall. Informed written consent was taken. Resection of oral cancer was done using standard method with 1 cm gross 3 Dimensional margin. Skin paddle for pmmc flap was marked over the pectoralis major muscle boundaries with extension to skin over serratus muscle lateral, thereby increasing the size of skin paddle by including skin from neighbor vascular territory [Fig. 1]. Lateral border of p. major muscle was defined and modification was made while raising skin over serratus muscle by taking the portion of serratus muscle along with extra skin over serratus muscle [Fig. 2], thereby preventing exposure of posterior surface of subcutaneous fat beyond the boundary of pectoralis major muscle. Rest of the PMMC flap was raised using standard method taking care of the major pedicle [Fig. 3] and bipedal flap reconstruction was done. Skin over the serratus muscle was used to

reconstruct inner lining of buccal mucosa. Following parameters were studied in the immediate post operative period – necrosis partial or complete of inner skin paddle, incidence orocutaneous fistula.

**Figure 1: Marking of Flap with lateral extension.**



**Figure 2: cutting serratus anterior muscle fibers Along with skin paddle (arrow).**



**Figure 3: Raised PMMC flap: arrow marking Serratus anterior muscle fibers.**

## RESULTS

Out of 20 patients who underwent the PMMC flap reconstruction using the modification, partial necrosis was observed in 5 cases (5/20; 25%) (Table 1). Partial necrosis was identified by color change with blue/ purple color of the area with partial necrosis which may be followed with deepithelization with or without orocutaneous fistula. Complete necrosis of extra skin paddle was observed in 2 cases (2/20; 10%) (Table 1). Complete necrosis was identified by progressive darkening and sloughing out of necrosed area with intraoral suture line dehiscence with or without orocutaneous fistula. Orocutaneous fistula with neck suture line dehiscence was observed in 2 case (2/20; 10%) of complete necrosis. Total incidence of flap ischemia was 7 cases (7/20; 35%) (Table 1).

**Table 1: Outcome of extra skin paddle from neighbouring vascular territory.**

Outcome of extra skin paddle overlying serratus	Incidence (n=20)	Percentage
Complete necrosis	2/20	10%
With OCF	2/2	100%
Partial necrosis	5/20	25%
With OCF	0/5	0%

## DISCUSSION

The concept of angiosome was first introduced by Taylor and Palmer in 1987.<sup>[4]</sup> This concept divides body into 3D blocks with an arteriosome and venosome and a definite area of skin supplied by perforators from underlying muscles. Neighbouring angiosomes were connected by a series of thin diameter vessels called “choke” vessels.<sup>[5]</sup> These vessels are of utmost significance in providing blood supply to neighbouring angiosome in event of their vascular cutoff like raising flap with inclusion of skin from neighbouring angiosome. Skin over pectoralis major muscle with muscle makes one angiosome with serratus muscle with skin over it forms separate angiosome. Choke vessels are communications between two angiosomes. They however are very delicate vessels which can be easily thrombosed by small trauma such as traction or pressure as may occur in postoperative period following PMMC flap. Events like flap edema, downward traction due to fixed pedicle and gravity may traumatize it. Our theory was to provide a cushion for these choke vessels to prevent their accidental shear by keeping a portion of underlying muscle attached to it. The concept of angiosome and choke vessels have been supported by studies using Fluorescence Angiography.<sup>[6]</sup>

In our study, only 2 out of 20 cases had complete necrosis of the extra paddle with orocutaneous fistula, an event which significantly delays recovery and administration of adjuvant radiation, which was needed in all case as they were T4. 5/20 (25%) of cases had partial necrosis of the extra paddle but without orocutaneous fistula and without significant delay in recovery and administration of adjuvant radiation. This 25% incidence of partial flap loss can be attributed to small diameter of choke vessels which may be insufficient to shunt blood to extra skin paddle. It may also be due to inconsistent anatomy of choke vessels.

Other studies regarding PMMC flap reconstruction shows a large variation in complications with rate of complications ranging from 6.8% incidence of partial skin loss by Ariyan to 64% incidence of complications in study by Shah JP. Deazevedo in study of 55 cases had failure rate of 8%.<sup>[7]</sup> In study by Gupta A et al there is around 11% incidence of orocutaneous fistula.<sup>[8]</sup>

Pectoralis major myocutaneous flap has stood the test of time as the most reliable pedicled flap for reconstruction of large defect following resection of oral cancer. It provides sufficient tissue for large defect coverage. With our technique, we can increase the flap/defect ratio, thereby preventing unnecessary stretching of flap leading to cut through of sutures and flap complications. Mismatch between defect size and flap size is a common problem in case of huge defects. This can be avoided by borrowing skin from neighbor angiosomes along with underlying fascia/muscle.

**CONCLUSION**

Concept of angiosome and choke vessels has revolutionized the plastic and reconstructive surgery field with better understanding of flap vascularity thereby leading to better flap design with minimal complications. We advocated that by gently preserving the choke vessel by use of underlying muscle as cushion, we can increase the limits of PMMC flap.

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